Southern Africa Compressed Gases Association

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SAFETY ALERT

Over-pressurisation of Ammonia Cylinders

Cylinder bulging and paintwork flaking (immersion?)

INCIDENT DESCRIPTION:
In the past few months 2 'bulging' ammonia cylinders have been identified. Both cylinders were empty.

There is no evidence to indicate overfilling of these cylinders. This, therefore, shows that the cylinders were over-pressurised due to misuse by the user.

BACKGROUND
Liquefied compressed gases in a cylinder exist in liquid and gaseous form at the vapour pressure of the gas. When vapour (gas phase) is withdrawn from the cylinder the temperature and pressure in the cylinder decrease. Under normal conditions this heat can be recovered fro the ambient air surrounding the cylinder and the vapour pressure maintained. However, if the user exceeds the maximum recommended withdrawal rate of the cylinder the vapour pressure of the cylinder will decrease considerably. This can lead to users trying to apply heat to the cylinder to improve the gas-phase withdrawal rate.

With liquid-phase withdrawal the liquid is pushed from the cylinder by the vapour pressure of the product. As the liquid is removed the volume of the vapour space increases ad the vapour pressure decreases. Sometimes the vapour pressure is not high enough to push the liquid out at the required rate and this can lead to users trying to pressurise the cylinder with an inert gas (e.g. Nitrogen) to raise the cylinder pressure.

Pressurisation of these low pressure cylinders due to the addition of another gas and / or uncontrolled heating methods can exceed the design pressure of the cylinder causing the walls of the cylinder to 'bulge'. If continued this could lead to a rupture of the cylinder under pressure. Immersion of a cylinder in a water bath has the additional hazard of degrading the cylinders's external surface which can compromise the cylinder's mechanical integrity and cause cylinder failure.

HAZARDS / DANGERS
(i) PRESSURE RELEASE
(ii) PRODUCT RELEASE - In the case of ammonia the hazardous properties include:

- FLAMMABILITY : Lower Explosive Limit (LEL) 15% - Upper Explosive Limit (UEL) 28%
- TOXICITY : Short Term Exposure Limit (STEL) = 35ppm
- CORROSIVE / CHEMICAL BURNS

ACTIONS
- Awareness training for all employees dealing with ammonia to look out for signs of over-pressurisation of cylinders
- Communication to customers / users to inform them of the dangers of uncontrolled heating and / or pressurisation of Cylinders